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- (56) Prior Art Documents
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AU 509436 24932/77 F16P 3/14 G08B 13/18
- (57) Claim

1. A safety apparatus for use with a press brake of the kind having a moving blade provided with a leading edge and a platform against which an item may be pressed, the safety apparatus including:

a corresponding light emitting means and light receiving means for mounting in fixed relationship with the leading edge of the moving blade, so as to move in conjunction with the blade, said light emitting means being mounted at one end of the moving blade forwardly and laterally of the leading edge, and the corresponding light receiving means being mounted at the opposing end of the moving blade;

said light emitting means emitting a beam of light in parallel and substantially forward and lateral prescribed relationship to the leading edge, and said corresponding light receiving means being disposed to receive the beam of light; and

control means connected to said light receiving means to sense receipt of the emitted beam by said light receiving means, and to the press brake to

control halting operation of the moving blade, whereby said control means causes the cessation of movement of the blade in response to a sensed interruption of receipt of an emitted beam.

12. An apparatus including:

a press brake having a moving blade provided with a leading edge, said blade having opposite ends and opposite sides, and a platform against which an item may be pressed; and

a safety apparatus connected to said press brake as claimed in any one of claims 1 to 10.

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INVENTION TITLE: "BRAKE PRESS SAFETY
APPARATUS"

ASSOCIATED PROVISIONAL APPLICATION NOS:

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The following statement is a full description of this
invention including the best method of performing it known
to me/us:-

The present invention relates to a press brake safety apparatus.

Presently, there may be provided on a press brake an arrangement of infra red light curtains lying in a plane substantially parallel to that defined by the blade of the brake press. Breaking this light curtain at any level will halt operation of the
5 press brake.

Such arrangements serve to prevent an operator having any part of their body, particularly their hands, near or under the blade when the pressing operation takes place. In addition to the light curtains the press operates in an incremental manner so that movement of the blade over an increment requires a positive
10 action, such as depressing a foot pedal. This too is intended to increase safety.

This present arrangement results in numerous unnecessary interruptions in the operation of the press brake. In particular, breaking the light curtain at a point where no danger is possible, such as 450mm from the blade, or during the slow incremental progress of the blade, will cause an unnecessary interruption in the
15 operation of the press brake.

Also, failure of the light curtain in some manner can leave the operator unaware and therefore in danger of injury.

At present, a rear side of the blade is required to be enclosed by a mechanical and physical barrier. This precludes access to the rear of the blade during
20 operation thereof thereby further reducing the efficiency and efficacy of the press brake. In addition, this requirement can limit the type of jobs performed by the press brake.

The present invention attempts to overcome each of the abovementioned problems associated with the prior art.



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2 In accordance with one aspect of the present invention
3 there is provided a ~~brake~~ ^{brake} press safety apparatus for use on
4 a ~~brake~~ ^{brake} press of the kind having a moving blade having a
5 leading edge and a platform against which an item may be
6 pressed, the safety apparatus comprising at least one beam
7 of light mounted at a level marginally forward of and
8 substantially parallel to the leading edge so as to move
9 with the blade, the interruption of the beam causing the
10 movement of the blade to stop and thereby halting operation
11 of the ~~brake~~ ^{brake} press without the leading edge contacting the
12 item.

13 Preferably, a single beam is mounted each side of the blade
14 and running substantially parallel thereto.

15 Still preferably, interruption of the beam will also result
16 in the lighting of warning lights mounted on the ~~brake~~

17 ~~press~~ ^{brake}. Also, the beam will be electronically linked to a
18 form of programmable logic controller such that the

19 function of the ~~brake~~ ^{brake} press may be governed thereby.

20 The present invention will now be described, by way of

21 example only, with reference to the following drawings:-

22 Figure 1 is a front view of a ~~brake~~ ^{brake} press incorporating the
23 safety apparatus of the present invention;

24 Figure 2 is an upper perspective view of part of the safety
25 apparatus and ~~brake~~ ^{brake} press of Figure 1;

26 Figure 3(a), (b) and (c) is a partial side view cross
27 section of the safety apparatus and ~~brake~~ ^{brake} press of Figure 1
28 in use;

29 Figure 4(a), (b) and (c) is a partial side view cross
30 section of the safety apparatus and ~~brake~~ ^{brake} press of Figure 1



in use;

Figure 5 is a partial side view cross section of the safety apparatus and press brake of Figure 1 having an additional infra red beam provided thereon;

Figure 6 is a partial side view cross section of the safety apparatus and press
5 brake of Figure 5 having a number of additional infra red beams provided at the front thereof;

Figure 7 is a partial side view cross section of the safety apparatus of Figure 5 having additional fixed rear beams for special sheet profiles.

Figure 8 is a ladder diagram of the program for a Programmable Logic Collector
10 (PLC) for use in the present invention.

In Figure 1 there is shown a press brake 10 comprising a housing 12, a blade frame 14 and a base 16. The blade frame 14 has provided therein a blade 18 and two pivot means 20, as can be seen in Figure 2. The two pivot means 20 are located one at each end of the blade 18.

15 Both a light emitter means 22 and a light receiving means 24 are mounted to each pivot means 20 and as such are rigidly linked to the blade frame 14. The light emitter means 22 and light receiving means 24 linked to each pivot means 20 are arranged so as to be opposed to the light receiving means 24 and light emitter means 22 respectively linked to the other pivot means 20, as can be best
20 seen in Figure 2.

A beam of light 26 passes between each opposed light emitter means 22 and light receiving means 24. Each light emitter means 22 and light receiving means 24 has a light scatter guard 28 provided thereon. The beams 26 run



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2 substantially parallel to the blade 18 on a front side 18a
3 and a rear side 18b thereof.

4 A number of over-ride means in the form of switches 30 are
5 also provided on the blade frame 14. The blade frame 14
6 has a number of warning means in the form of lights 32
7 provided thereon.

8 The ~~brake~~ press ^{brake} 10 incorporates a manual operator means in
9 the form of a foot switch 34, as can be seen in Figure 1.

10 The blade 18 is mounted in a substantially upright manner
11 and has a leading edge 36, as shown in Figures 2 to 4.

12 The base 16 has a platform 38 having a recess 40 provided
13 therein. An item of material to be pressed into the recess
14 40, for example a sheet 42 may be provided on the platform
15 38, as shown in Figures 3 and 4. It is to be understood
16 that the recess 40 may take any form required by a user of
17 the ~~brake~~ press ^{brake} 10.

18 In Figure 4 there is shown a user's hand 44 manipulating
19 the sheet 42.

20 In Figure 5 there is shown the blade 18 and platform 38 of
21 Figures 3 and 4 having a feeler light beam 50 provided
22 therewith. The feeler beam 50 runs substantially parallel
23 to the blade 18 and is located substantially directly
24 forward of, and spaced apart from, the leading edge 36
25 thereof.

26 In Figure 6 there is shown a number of light beams 52
27 arranged to run substantially parallel to the front 18a of
28 the blade 18 in a vertical configuration forming a sheet
29 54. Such a configuration is intended for a blade 18 having
30 a number of sections thereto which are set at differing



2 levels above the platform 38.

3 In Figure 7 there is shown a number of light beams 56
4 arranged to run substantially parallel to the rear face 18b
5 of the blade. The light beams 56 form a vertically
6 disposed sheet 58 and a horizontally disposed sheet 60.

7 A form of Programmable Logic Controller (PLC) is provided
8 for the operation of the ~~brake~~ ^{brake} press 10 and associated
9 safety apparatus, as shown in Figure 8. The PLC is
10 electronically linked to the footswitch 34, the light
11 emitter means 22 and light receiving means 24, the switches
12 30, the lights 32 and a hydraulic motor (not shown) driving
13 the blade frame 14 and blade 18. This linking is arranged
14 in a manner allowing co-ordination of the operation of the
15 ~~brake~~ ^{brake} press, as described in the following paragraphs.

16 In use, a sheet 42 to be pressed is inserted in the ~~brake~~
17 ^{brake} press 10 so as to overlay the platform 38, as can be best
18 seen in Figures 3(a), 4(a), 5, 6 and 7.

19 Each light emitter means 22 and light receiving means 24
20 pair is arranged so that the beam 26 therebetween is
21 positioned marginally forward of the leading edge 36 of the
22 blade 18, as can be seen in Figures 3, 4, 5, 6 and 7.

23 Particularly now with reference to Figures 3 and 4, upon an
24 initial activation of the footswitch 34, if the beams 26
25 are uninterrupted, the blade frame 14 will descend from a
26 raised position. Accordingly, the blade 18 and light means
27 22 and 24 move with the blade frame 14.

28 When the leading edge 36 of the blade 18 is approximately
29 8mm away from the platform 38 the blade frame 14 will stop,
as shown in Figure 3(b), at what is termed the "~~rip~~ ^{nute}"



1
2 arranged and interconnected in a manner that allows,
3 amongst other functions, the return of the blade 18 and
4 associated components to the raised position upon
5 interruption of a single or both beams 26.

6 The addition of the feeler beam 50 as seen in Figures 5 to
7 7 allows breaking of it to stop descent of the blade frame
8 14 and blade 18. As such, it is not possible for a user to
9 set a ^{nip}~~nip~~ point on the ~~brake~~ ^{brake} press 10 that is smaller than
10 the distance of the feeler beam 50 from the leading edge 36
11 of the blade.

12 The addition of the sheet 54 of beams 52, as can be seen in
13 Figure 6, allows interruption of these beams 52 to stop the
14 blade 18. Such an arrangement is envisaged to be necessary
15 if the blade 18 comprises a number of sections and where at
16 least two thereof are set at differing levels above the
17 platform 38. This would require two or more nip points
18 corresponding to the two or more levels of sections
19 comprising the blade 18. Once a first nip point was
20 reached and it became necessary to override the
21 interruption of beams 50 and 26 to allow contact of the
22 blade 18 and the sheet 42 it is possible that a user may
23 insert his hand 44 between the sheet 42 and a following nip
24 point. If this was to happen then the interruption of
25 beams 52 will halt the blade 18 and return it and its
26 associated components to their raised position.

27 The addition of the beams 56 forming a sheet 58 and a
28 mechanical barrier 60 protect against access to the blade
29 18 from the rear 18b thereof, as can be seen in Figure 7.
Interruption of the beams 56 results also in the stopping



1
2 of the descent of the blade 18 and returns it and its
3 associated components to their raised position.

4 It is envisaged that infra-red light or laser (Light
5 Amplification by Stimulated Emission of Radiation) light
6 may be used to form the beams 26, 50, 52 and 56.

7 It is also envisaged that the pairs of opposed light
8 emitter means 22 and light receiving means 24 may be
9 replaced by a single means capable of both emitting and
10 receiving a light beam in combination with a reflective or
11 mirror means located opposite thereto. One of these units
12 could be mounted either side of the blade 18.

13 Still further, it is to be understood that any obstruction,
14 and not only a users hand 44 interrupting the beams 26 will
15 cause the descent of the blade 18 to stop.

16 The arrangement of the present invention allows an operator
17 to work close to the blade 18 without being able to entrap
18 his or her hands between the blade 18 and sheet 42 or
19 platform 38. In addition, the rear of the brake press need
20 not be enclosed by mechanical and physical barriers which
21 restrict access thereto.

22 The non-incremental form of movement of the blade 18 in
23 normal operation reduces stress on machine hydraulics and
24 continuous activation of the foot switch 34.

25 Modifications and variations such as would be apparent to a
26 skilled addressee are deemed within the scope of the
27 present invention.

The Claims defining the invention are as follows:-

1. A safety apparatus for use with a press brake of the kind having a moving blade provided with a leading edge and a platform against which an item may be pressed, the safety apparatus including:
 - 5 a corresponding light emitting means and light receiving means for mounting in fixed relationship with the leading edge of the moving blade, so as to move in conjunction with the blade, said light emitting means being mounted at one end of the moving blade forwardly and laterally of the leading edge, and the corresponding light receiving means being
10 mounted at the opposing end of the moving blade;

said light emitting means emitting a beam of light in parallel and substantially forward and lateral prescribed relationship to the leading edge, and said corresponding light receiving means being disposed to receive the beam of light; and
 - 15 control means connected to said light receiving means to sense receipt of the emitted beam by said light receiving means, and to the press brake to control halting operation of the moving blade, whereby said control means causes the cessation of movement of the blade in response to a sensed interruption of receipt of an emitted beam.
- 20 2. A safety apparatus as claimed in claim 1, wherein said control means includes means for overriding the halting of the press brake by said control means after the blade descends to a predetermined position or mute point, so that said control means does not respond to subsequent interruptions of the emitted light beam.
- 25 3. A safety apparatus as claimed in claim 1 or 2, including a plurality of said corresponding light emitting means and light receiving means, the light beam of one light emitting means to be disposed to the operator side of the press brake



and the light beam of another light emitting means to be disposed to the remote side of the press brake.

4. A safety apparatus as claimed in claim 2 or claim 3 as dependent upon claim 2, wherein said control means halts the movement of the blade automatically at
- 5 said predetermined position or mute point above the platform, and permits the blade to move beyond this level only in response to a user of the press brake performing a manual operation associated with said control means.
5. A safety apparatus as claimed in any one of claims 2 to 4, including a further beam located directly forward of and spaced apart from the leading edge of the
- 10 blade, said control means being responsive to interruptions of the further beam by the item or platform to halt movement of the blade, the level above the platform at which the blade is halted being predetermined ensuring that the mute point is not too close to the item or platform.
6. A safety apparatus as claimed in any one of the preceding claims, in which
- 15 the beam or beams are generated by a light emitter means and received in a light receiver means each rigidly linked to the blade and moving therewith.
7. A safety apparatus as claimed in any one of claims 1 to 5, wherein the beam or beams are generated and received in a single means capable of both emitting and receiving a light beam, the single means being rigidly linked to one end of
- 20 the blade and a reflective or mirror means rigidly linked to the other end thereof opposing the single means.
8. A safety apparatus as claimed in any one of the preceding claims, including additional beams provided at either or both the front and/or rear of the blade thereby further limiting access thereto, the interruption of said additional beams
- 25 causing said control means to halt movement of the blades.



9. A safety apparatus as claimed in any one of the preceding claims, wherein said control means includes a form of Programmable Logic Controller electronically linked to the or each beam and to a motor driving movement in the beam, the Programmable Logic Controller causing the halting of movement of
5 the blade upon interruption of the or each beam.

10. A safety apparatus substantially as hereinbefore described with reference to Figures 1 to 4.

11. A safety apparatus substantially as hereinbefore described with reference to Figures 1 and 5, 6 or 7.

10 12. An apparatus including:

a press brake having a moving blade provided with a leading edge, said blade having opposite ends and opposite sides, and a platform against which an item may be pressed; and

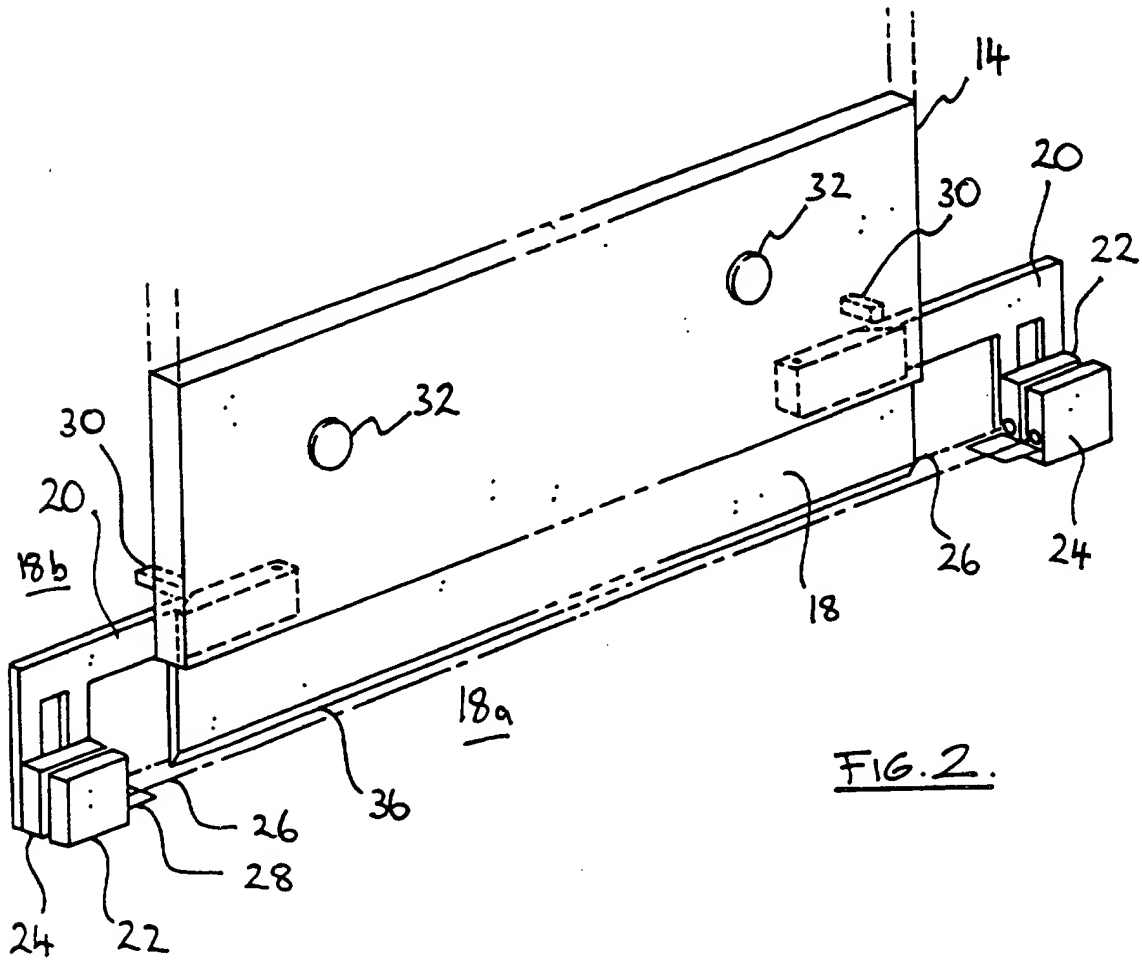
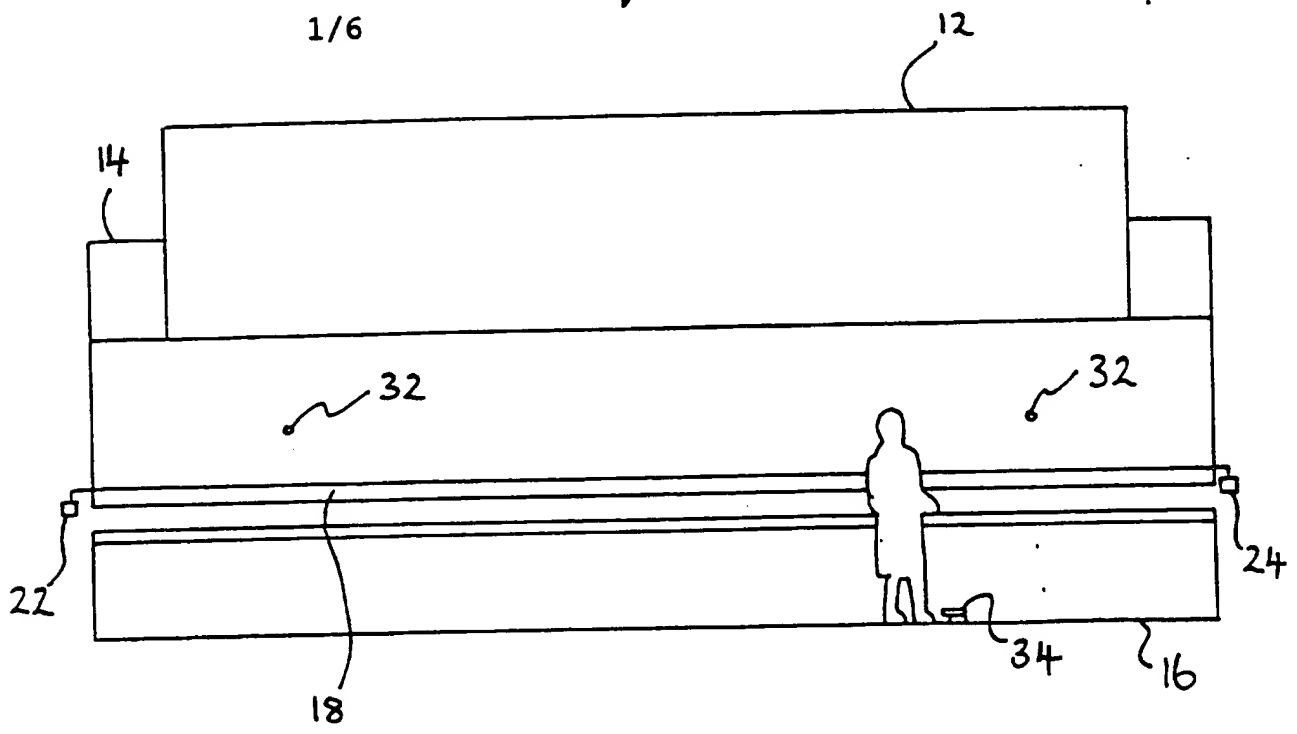
15 a safety apparatus connected to said press brake as claimed in any one of claims 1 to 10.

Dated this TENTH day of JANUARY 1996.

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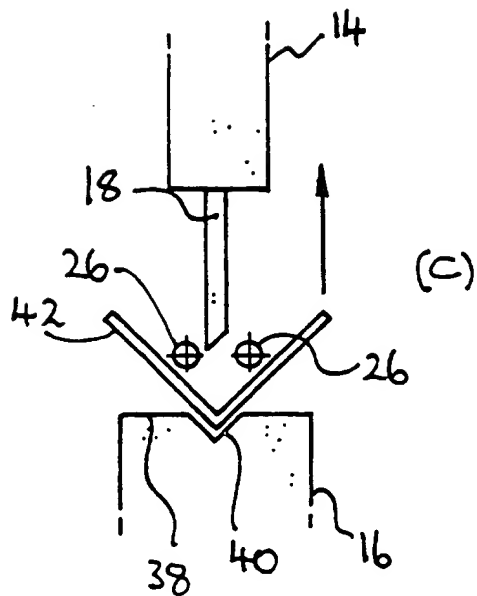
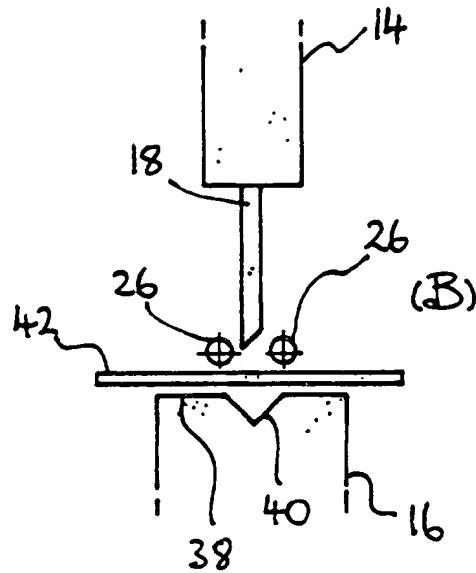
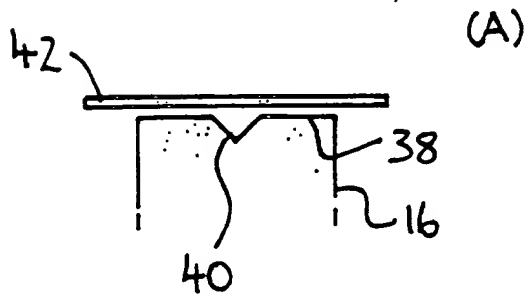
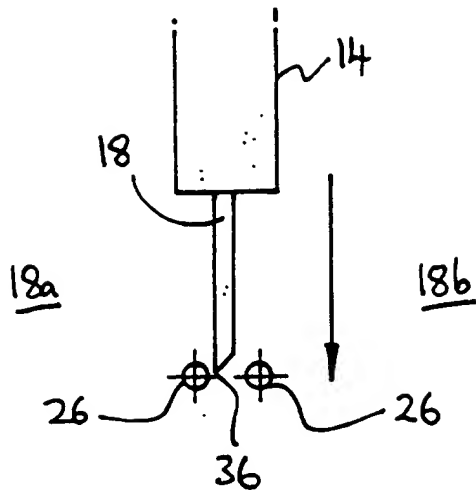
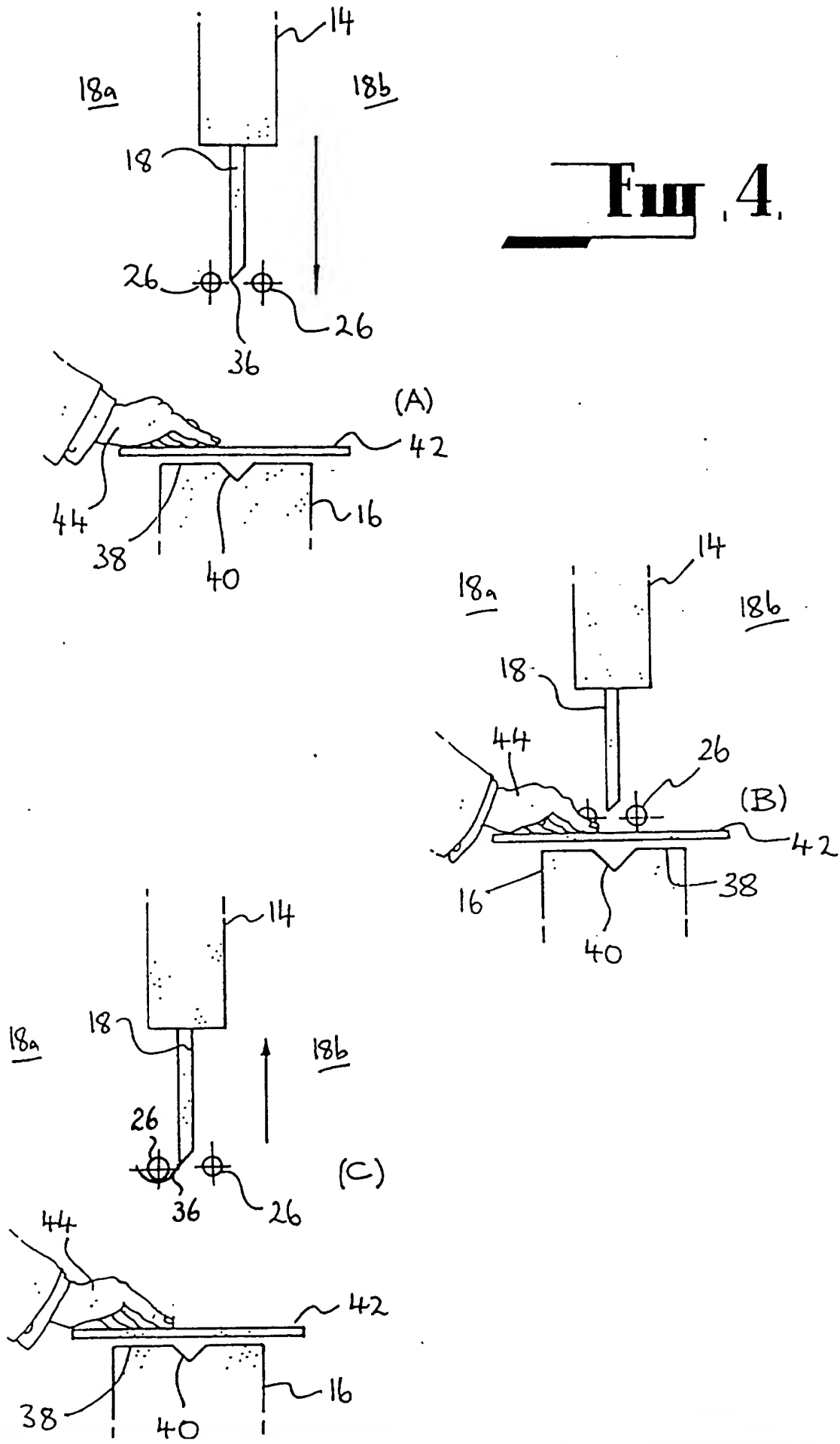
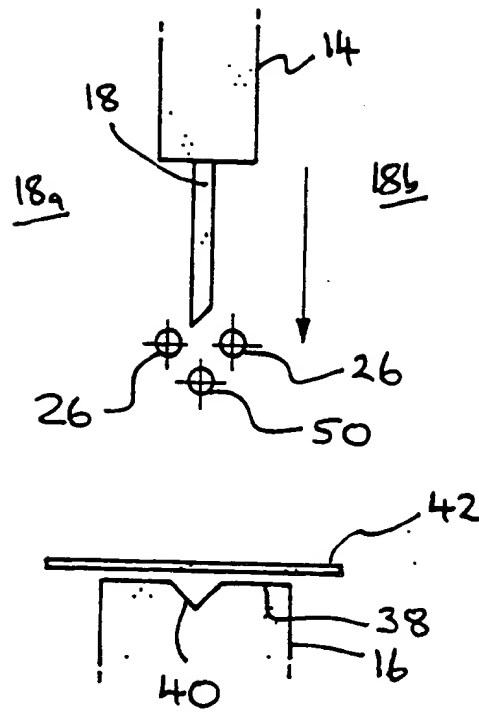
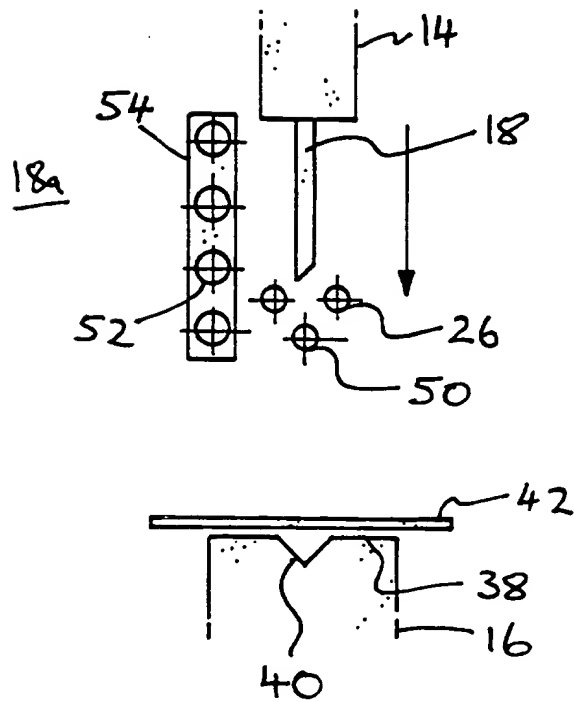
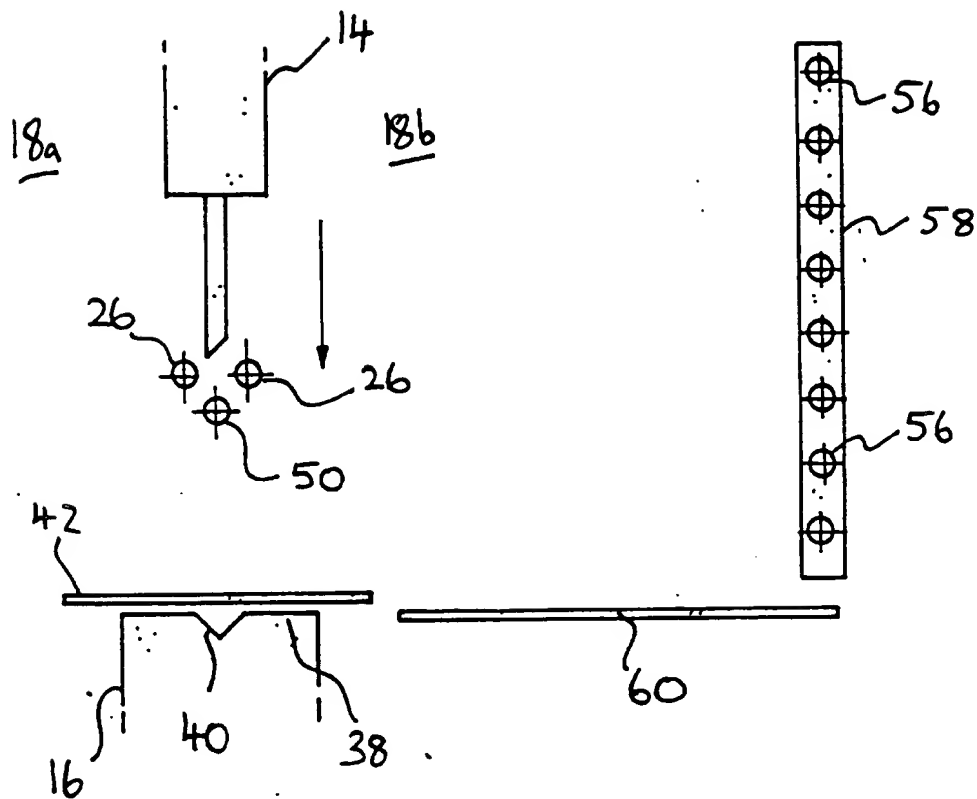
FIG. 3

Fig. 4.



Fig 518bFig 6

Fig 7

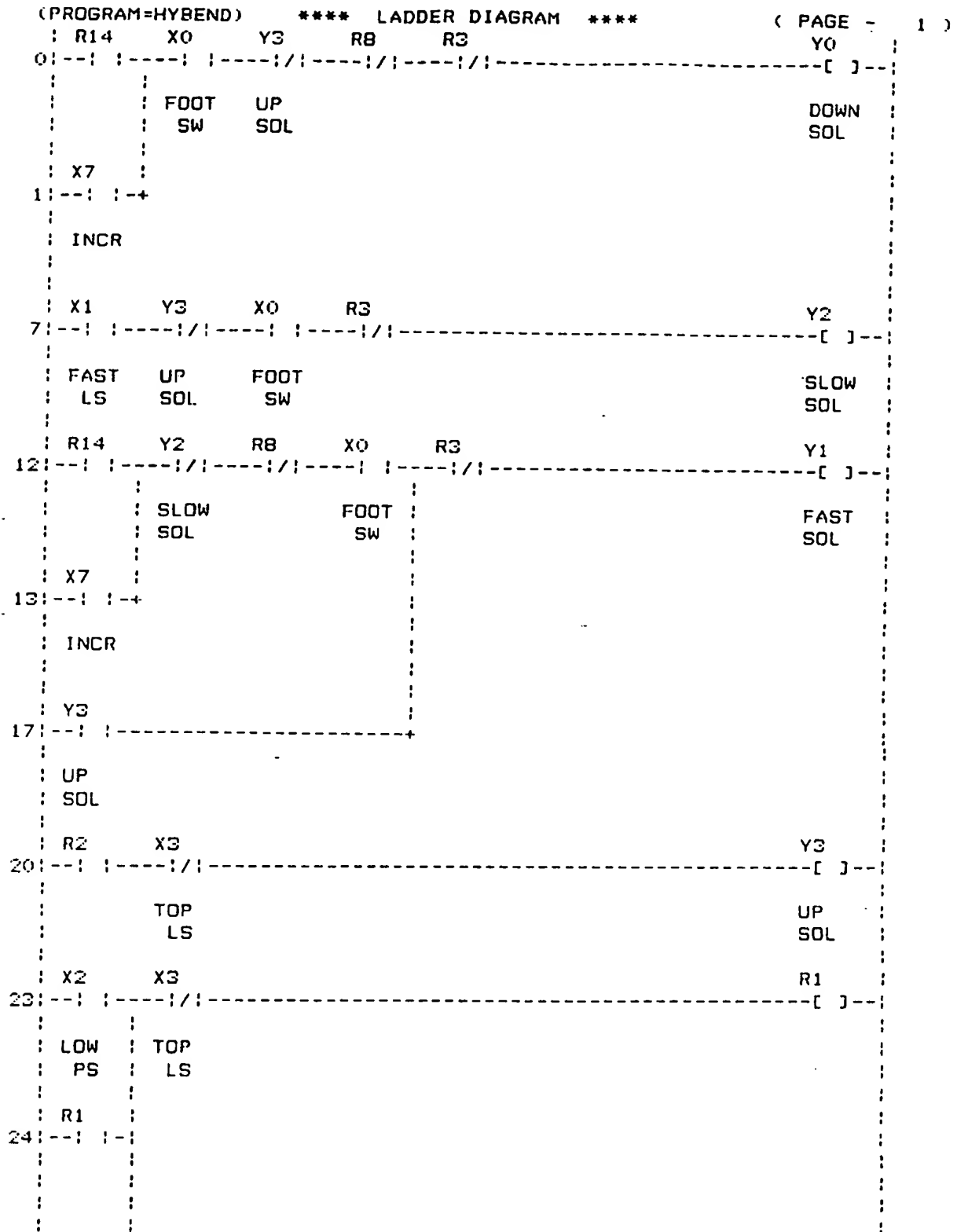


Fig. 8a,

(PAGE - 2)

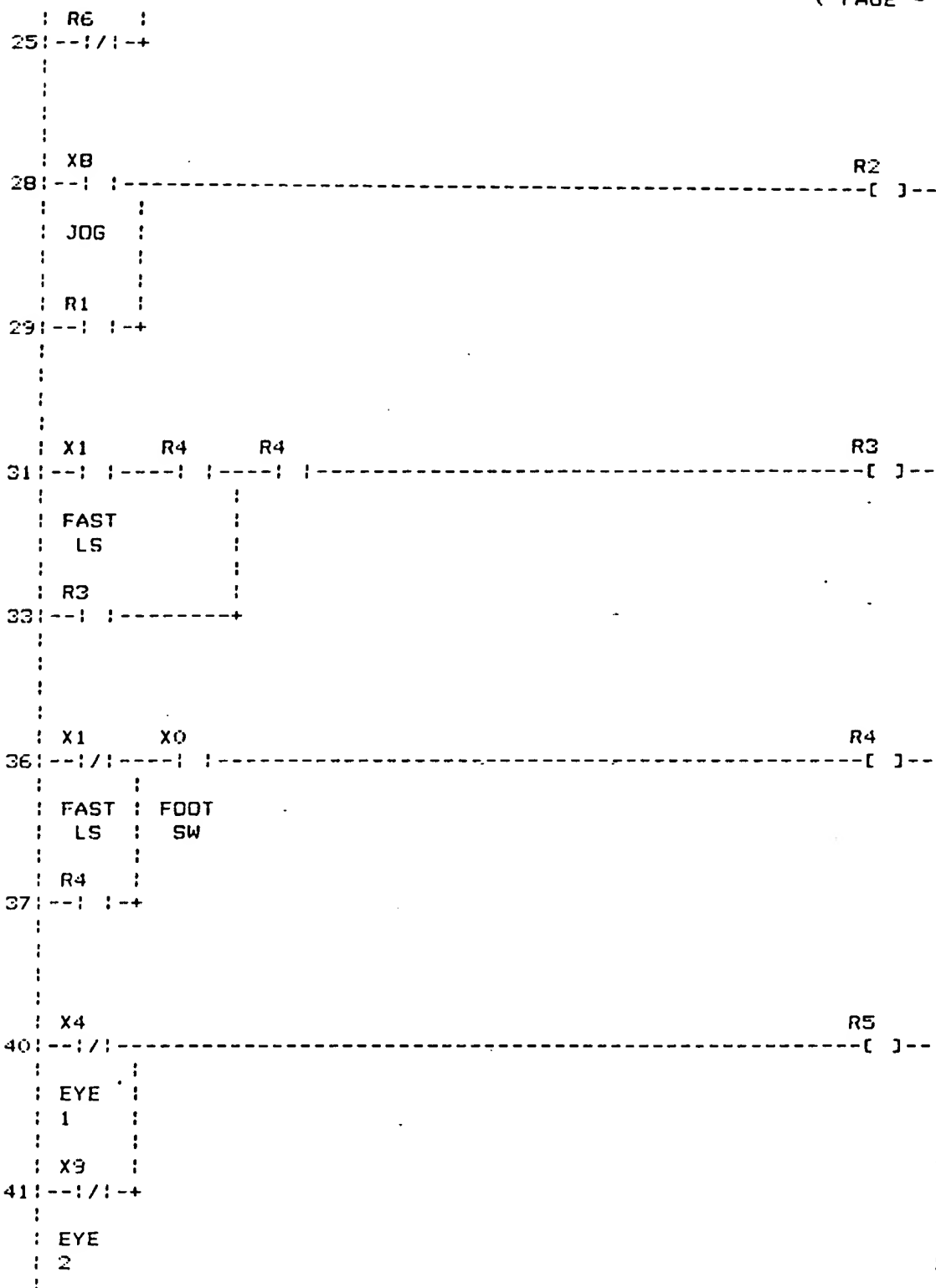


Fig. 8b.

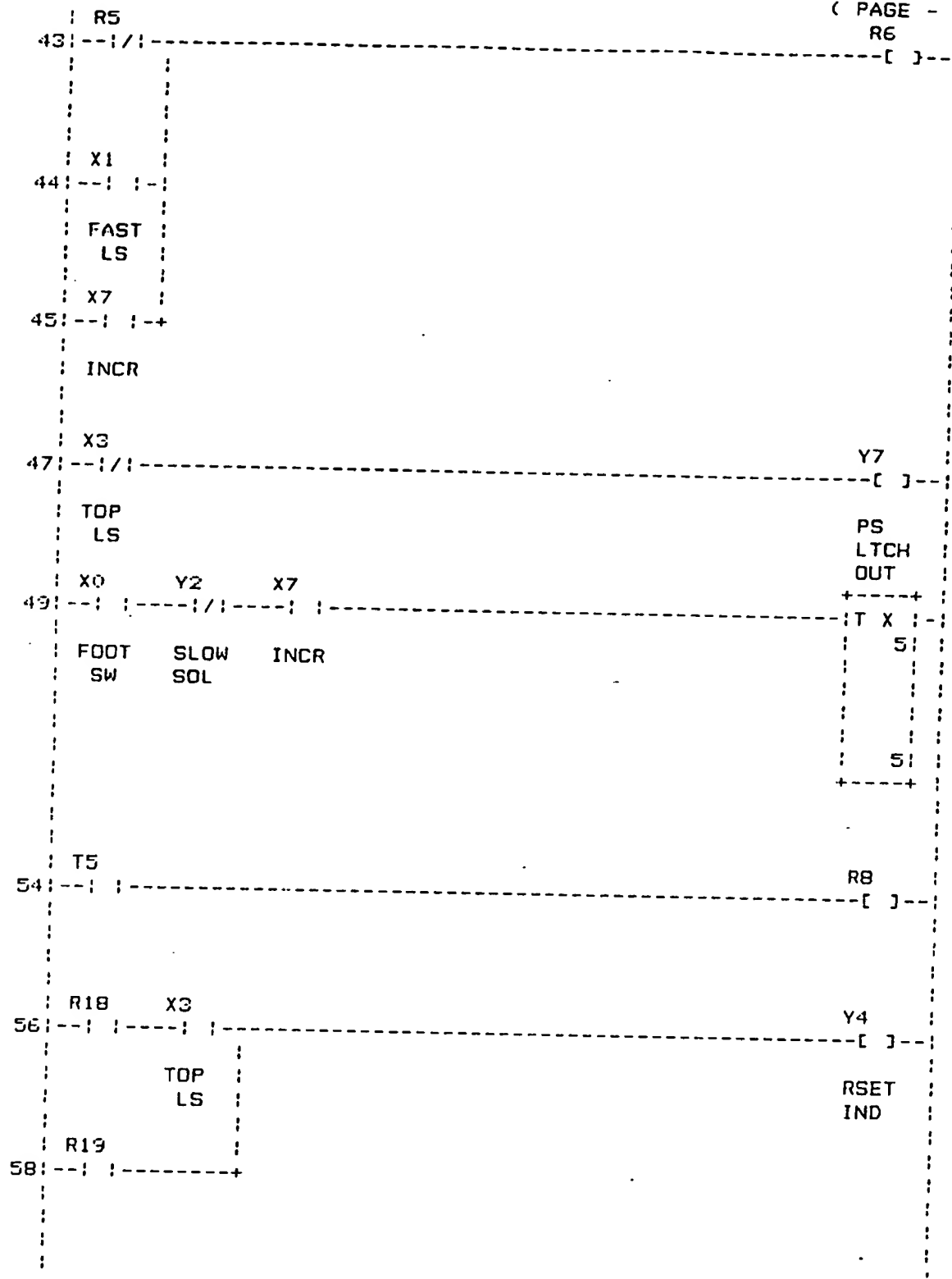


Fig. 8 c,

60	X4								R19
	---	/	/						[]
	EYE								
	1								
61	X9								
	---	/	/						
	EYE								
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63	X7							Y6	
	---								[]
	INCR							INCR	
								IND	
65	X2		X3					R15	
	---		/	/					[]
	LOW		TOP						
	PS		LS						
66	R15								

69	X1		X3					R16	
	---		/	/					[]
	FAST		TOP						
	LS		LS						
72	R15		R16					R17	
	---								[]
75	X3		X4		X9			R18	
	---		/	/	/				[]
	TOP		EYE		EYE				
	LS		1		2				
79	X2		X3					R11	
	---		/	/					[]
	LOW		TOP						
	PS		LS						

Fig. 8d.